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STATIC BEHAVIOR OF POLY (ACRYLIC ACID) OLIGOMER STABILIZED SUPER PARAMAGNETIC FERRO-FLUID IN SEVEN AND THIRTEEN AXIAL GROOVES JOURNAL BEARING

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Original Article

ABSTRACT

I explore theoretically the fundamental projective performance of poly (acrylic acid) oligomer stabilized Super paramagnetic Ferro fluid. I derived the modified sugato micro continuum theory. Based on the derivation, this paper theoretically the rheological effects of lubrication performance of finite journal Bearing. On account of poly(acrylic acid) oligomer stabilized Super paramagnetic Ferro fluid barriers with nano particles of magnetic particle a mean diameter of 10-15 mm. Which are in the range of super paramagnetism prepared by the traditional method of co-precipitation from ferrous and ferric electrolyte solution. I theoretically derived also fundamental velocity equation of poly oligomer stabilized Super paramagnetic Ferro fluid With high PH value velocity of fluid flows is zero pressure gradients for the film extent, and the film pressure is solved numerically by conjugate gradient method of iteration. Bearing characteristics are calculated and the utility of its performance has been compared with the coupled stress fluid (laminar). All results agree qualitatively with all experimental works.

KEYWORDS: High Polarized, Modified Ferro-Fluid Stroke-Equation, Magnetic Polar Characteristic, Pressure Distribution Curve

NOTATION : (Non-Regular)

hm+ =PH+ magnetic field intensity

hm- =PH- magnetic field intensity

h m,k =stress tensor

wk,I,j =Spin vector

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INTRODUCTION

Ferro fluid colloidal dispersions of small single domain magnetic particles suspended in a carrier, Ferro fluid characteristically have both magnetic and fluid properties. I have found a devise range of application such as audio device, inertia damper, steeper motors, sensor, vacuum scale Electromagnetic shielding, high density digital storage [1,2]. Iron oxide (Fe3o4),the dominant Magnetic material in magnetic field preparation can be synthesized though the co precipitation of Fe (II)chloride tetra hydrate (99%) & Fe (III) Chloride change particle through interaction Hex hydrate (97%) salts by addition of base. Stable Ferro fluid can be prepared by absorption of stabilized agents on the surface of magnetic particle after synthesis process. The feasibility of preparing magnetic fluid using anionic and no anionic surfactant as dispersing agents has been examined[3,4].Massart obtained stable

aqueous alkaline and acidic magnetic liquid by free precipitation [5,6]. The nature of the counter ions and the PH of the suspension played an important role in stabilized the change particle though interaction between double layer. Although Ferro fluid all analytical invention have already been restricted to two classical limiting case of infinity long and short bearing Sorge[7] in his numerically approach to finite journal bearing assuming the distribution of the pressure to because by the magnetic field. In the magnetic field it thus the magnetization is only depends on the applied force in the oligomer stabilized crystal. If broadly acts as either magnetization of the fluid reaches saturation state and is almost constant or the magnetization of the applied filed. In application of time invariant second scale groove angle 5.4410o accunatic for axial groove S.Ghosh [7]. I derived a direction velocity (u, v) Super paramagnatic Ferro fluid [8] based on sugato micro quantum [7] theory. I developed modified Reynolds equation for super paramagnetic Ferro fluid. Numerically using the conjugate gradient method or Simpson 1/3 rule computation with iterative form of load carrying capacity, attitude angle and frictional parameter & distinguished the flow under high value PH with a heavy velocity although with frictional parameter and pressure give more reduction scale on magnetic vertical misaligned with n =1, n<1, n>1 non dimensional Pressure curve**.**

Analysis

My derivation for a Ferro fluid under a magnetic field, the unit volume value of induced magnetic force is given by [9.10]

$$\bar{f}_m=\mu_o \bar{X}_m \bar{h}_m \text{ grad } \bar{\bar{h}}_m \tag{1}$$

Where B is the magnetic field density and (curl h_m) represents the induced free current. In the atomic crystal of Fe atoms ($1s^2,2s^2,p^5$) with its Liquid concentration the stage o Fe are translet wave ions upper and lower ionization ion state [$Fe_{02\to 03}{}^{+}$] Fe (II) or [$Fe^{++\to\ -}$] Fe(III),and the carboxylic acid group of PAA oligomer formed a complex structure iron oxide (Fe_3O_4) the dominant magnetic material in magnetic fluid preparation can be synthesized through the co precipitation, Fe(II) and Fe (III) state be addition of a base [8]. Stable Ferro fluid can be prepared by absorption of stabilized agents and the surface of magnetic particles after a synthesis process. The feasibility of preparing magnetic fluid using anionic or nonionic surfactants as dispersing agent has been examined [12]. Massart obtained liquids by free precipitation [3,4]. The nature of the countries and pH of suspensions acted an important role in stabilizing the charged magnetic particle though inter action between their double layer. The application of magnetic fluids, which are stabilized entirely by electrostatic repulsion with the restricted manner and thus the system, is overly sensitive to conditions such as pH and ions strength and offers little flexibility for changing the surface proper tic of the particles.

$$\sqrt{C}K_a = \text{STAGE I} \tag{2}$$

And base solution

$$[\alpha/K_\psi] = \text{STAGE II} \tag{3}$$

Where $\alpha = \sqrt[\frac{1}{2}]{\frac{K_a}{C}}$

The equation (1) is of state for Ferro fluid zero polar solution. Since the pH properties of the Ferro fluid are to be active with mole constituent in alkaline base solution and thus they are to be a conductive or generative free current

electron flow, composition comprise combined together to become a number of free electron flow induced fluid flow motion in constitution of Ferro fluid constituents.

η =η_o=constant, so

$\bar{F}=\frac{\bar{f}_{m1}}{\bar{f}_{m2}}$ where $\bar{f}_{m2}$ is a basic base magnetic field or normal static at 28^0 C or room temperature.

$\bar{f}_{m1}$ is the off alkaline basic of Ferro magnetic field in high polarized turbulency Current flow is $\bar{f}_{m1}K_m$. Induced magnetic field for alkali base becomes

Induced magnetic field for alkali base becomes

$\bar{f}_{m1}$= (Curl h $_m$) X $\bar{B}^+$ + $\mu_o M_g$ grad $\bar{\bar{h}}_m$ (4)

Induced magnetic field for alkali base of lower state of constituents precipitation

$\bar{f}_{m2}$= (Curl h $_m$) X $\bar{B}^-$ + $\mu_o M_g$ grad $\bar{\bar{h}}_m$ (5) Where $\bar{B}$ is magnetic field density vector alkaline it becomes $\bar{B}^+$ in Fe stage II and high concentration alkaline base solution $\bar{B}^-$ in Fe stage III in solution. So the induced magnetic force is given by

$\bar{f}_{m2}$= (Curl h $_m$) X $\bar{B}^-$ + $\mu_o M_g$ grad $\bar{\bar{h}}_m$ (6)

I worked on its electric positive potential with positive polarity Ferro fluid with it unique free flow fluid in induced current density velocity direction in stage II Fe solution. Similarity it is to Fe base stage III solution. Altogether it, Fe ions barriers 4.4 M.M to 5.2M.M (any micro polar lubricant)

$\bar{F} = \frac{\bar{f}_{m1}}{\bar{f}_{m2}}^{\bar{n}}$=k

Where 1<< $\bar{n}$ <<$\frac{C_p}{C_v}$

$\bar{n}$ =Polytropic function of induced polar moment exponent, for normal used Ferro fluid $\bar{n}$=1

From Sugato micro quantum theory [7], the field equation of an incompressible isothermal fluid with coupled stress

ρ$\frac{\partial \bar{q}}{\partial t}$ =ρf +$\frac{1}{2}$Curl$(\rho\bar{F})$+div(τ^s)+ $\frac{1}{2}$Curl (div$\bar{M}$) (8)

Whereτ^s,$\bar{M}, f$,$\bar{F}$ being poses the destination,

In vactorial tensor on at constitutive Force Tensor$t_{i,j}$ it posse

$t_{i,j}{}^{+}$= -p $\delta_{i,j}$ +λ div ($\bar{q}$)$\delta_{i,j}$+ 2$B^+ d_{i,j}$ -$\frac{1}{2}\epsilon_{i,j,k}\left[h_{m_{i,k}}{}^{\frown} + 4\mu_0\, \omega_{k_{r,r}}{}^{\frown} + \rho F_{m,j}{}^{(+\sigma-)}\right]$ (8)

It is being vice-vaccy on off opposite spin.

The magnetic stress tensor $h_{m_{i,k}}$ aeries the theory of lamic constitutive, with a spin vector.

$$h_{m_{i,k}} = \left[\frac{1}{3} h_{m_{i,k}} \ \delta_{i,j} + 4\mu_0 \ \omega_{k_{j,i}} + 4\mu_0\ '\omega_{k_{i,j}}\right] \tag{9}$$

$$\omega_{k_{i,j}} = \frac{1}{2} \text{Curl. div } (\bar{q}) \tag{10}$$

It posse that,

$$\omega_{k_{r,r}} = \omega_{k_{1,00}} + \omega_{k_{1,11}} + \omega_{k_{0,00}} + \omega_{k_{0,11}} \tag{11}$$

Under incompressible fluid with neglecting with magnetic body force and body flux force tensor or body spin couple force. Though it's being posse with $\nabla\bar{q}$ quatic stage of Ferro fluid and stability with non –polar zone.

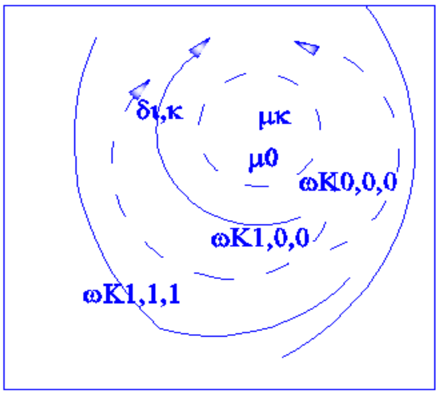

Figure 1: Sketch Lamic Tensor of Spin Vector

Although it's being rearranging the Sugato micro quantum equation, we can

div.($\bar{q}$)=0

$$\rho\left[\frac{\partial \bar{q}}{\partial t} + (\bar{q}.\nabla\bar{q})\right] = \text{-grad } (p) - \mu \text{ curl (curl } (\bar{q}) - \eta \text{ curl (curl (curl } (\bar{q})) \tag{12}$$

Considering at on unsteady flow with tic incompressible micro-polar fluid, which fill the half space y>0 and the above a (flat-plate) journal section. It has to be module occupying in x-z directional plan. Assuming that journal-bearing are in at rest $t=0^+$, It's to be ready to move with a constant velocity U along X-axis or oscillate with a velocity U cos (vt) in at on x –direction with neglecting it plank rate in polarize zone. It has to be a zero dipole effect of it actual equation.

It's $\bar{q}=(u(y; t); (0; 0))$ and its posse.

$$\rho\frac{\partial \bar{q}}{\partial t} = \rho f + \frac{1}{2}\text{Curl}\left(\rho\left[\mu_0 X^-{}_m h^+{}_m grad\left(h_m{}^+\right)\right]\right) + \text{div}(\tau^s) + \frac{1}{2}\text{Curl}\left[div\left(\bar{X}_m\, h_m{}^+\right)\right] \tag{13}$$

$$\rho\frac{\partial \bar{q}}{\partial t} = \rho f + \frac{1}{2}\text{Curl}\left(\rho\left[\mu_0 X^-{}_m h^-{}_m grad\left(h_m{}^-\right)\right]\right) + \text{div}(\tau^s) + \frac{1}{2}\text{Curl}\left[div\left(\bar{X}_m\, h_m{}^-\right)\right] \tag{14}$$

In constituentive it's posse with in on at buffer solution. The modified sugato Equation

$$PH = h_m{}^+ = pK_a + \log\left[\frac{Salt}{Acid}\right]$$

At on ionic state,

$$\text{PH}=h_m^{+}=\text{p}K_a+\log\left[\frac{\lambda_1}{\psi}\right] \quad (15)$$

$$\rho\frac{\partial\bar{q}}{\partial t}=\rho f+\frac{1}{2}\text{Curl}\left(\rho\left[\mu_0 X^{-}{}_m\left[\left\{\text{p}K_a+\log\left[\frac{\lambda_1}{\psi}\right]\right\}\right]_m grad\left(\text{p}K_a+\log\left[\frac{\lambda_1}{\psi}\right]\right)\right]\right)+\text{div}(\tau^s)+\frac{1}{2}\text{Curl}\left[div\left(\bar{X}_m\,\text{p}K_a+\log\left[\frac{\lambda_1}{\psi}\right]\right)\right] \quad (16)$$

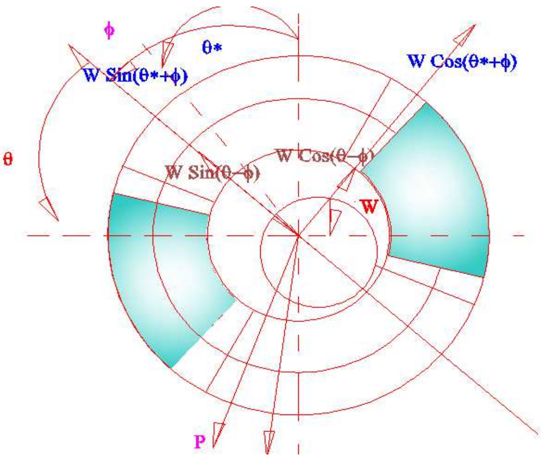

Figure 2: Physical Configuration of a Finite Axial Groove Seven and Thirteen Axial Groove

More generalized micro-continuum theory the fluid equation of an incompressible isothermal fluid with Couple-stress theory.

$$\rho\left[\frac{\partial v}{\partial t}\right]=-\nabla\text{p}+F_m+\frac{1}{2}\nabla B+(\mu_0-\eta\nabla^2)\nabla^2 V \quad (17)$$

$$\rho\left[\frac{\partial v}{\partial t}\right]=-\nabla\text{p}+\left(\rho\left[\mu_0 X^{-}{}_m h^{+}{}_m grad\left(h_m{}^{+}\right)\right]\right)+\frac{1}{2}\nabla B+(\mu_0-\eta\nabla^2)\nabla^2 V \quad (18)$$

$$\rho\left[\frac{\partial v}{\partial t}\right]=-\nabla\text{p}+\left(\rho\left[\mu_0 X^{-}{}_m h^{-}{}_m grad\left(h_m{}^{-}\right)\right]\right)+\frac{1}{2}\nabla B+(\mu_0-\eta\nabla^2)\nabla^2 V \quad (19)$$

If the body Couple and inertia forces (magnetic force) are to be nullity, the following assumption of Ferro-hydro-dynamic lubricant the following assumption of hydrodynamic lubrication applicant to be thin film

$$\frac{\partial p}{\partial x}=\left(\left[\mu_0 X^{-}{}_m h^{+}{}_m grad\left(h_m{}^{+}\right)\right]\right)+\mu\frac{\partial 2u}{\partial y2}-\eta\frac{\partial 4u}{\partial y4} \quad (20)$$

$$\frac{\partial p}{\partial y}=0 \quad (21)$$

$$\frac{\partial p}{\partial x}=\left(\left[\mu_0 X^{-}{}_m h^{-}{}_m grad\left(h_m{}^{-}\right)\right]\right)+\mu\frac{\partial 2u}{\partial y2}-\eta\frac{\partial 4u}{\partial y4} \quad (22)$$

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=0 \quad (23)$$

It's posse with axial and circumferential direction respect evilly. The bearing surface

$$u(x,0,z)=v(x,0,z)=w(x,0,z)=0 \quad (24)$$

$$\frac{\partial 2u}{\partial y2}(x,0,z)=\frac{\partial 2w}{\partial y2}(x,0,z)=0 \quad (25)$$

At the bearing journal surface

$$\frac{\partial 2u}{\partial y2}(x,h,z)=\frac{\partial 2w}{\partial y2}(x,h,z)=0 \quad (26)$$

$$u=\dot{\omega}R\left(\frac{y}{u}\right)+\frac{1}{2\mu}\left[\frac{\partial p}{\partial x}-\mu_0 X_m{}^{-}h^{+}{}_m grad(h_m{}^{+})\right] X\left[y(y-h)+2l^2\left\{1-cosh\left(\frac{h}{2l}\right)^{-1}\left(cosh\left(\frac{2y-h}{2l}\right)\right)\right\}\right] \quad (27)$$

$$V=\frac{1}{2\mu}\left[\frac{\partial p}{\partial x}-\mu_0 X_m{}^{-}h^{-}{}_m grad(h_m{}^{-})\right] X\left[y(y-h)+2l^2\left\{1-cosh\left(\frac{h}{2l}\right)^{-1}\left(cosh\left(\frac{2y-h}{2l}\right)\right)\right\}\right] \quad (28)$$

The modified Reynolds's Equation in ferrotic - modulatic polar constituent in at on Equation

(23) put on

$$\frac{\partial 2p}{\partial x2}+\frac{1}{2\mu_0}\left\{\frac{\partial p}{\partial x}+\frac{\partial p}{\partial z}\right\}=$$
$$\left\{\left(X_{m_{00}}\nabla divh_m{}^{+}-X_{m_{01}}\nabla divh_m{}^{+}\right)\left(f(h,l)\right)+\left(X_{m_{00}}\nabla div.h_m{}^{-}-X_{m_{01}}\nabla divh_m{}^{-}\right)\left(f(h,l)\right)\right\}+$$
$$\left[\frac{1}{2}\left\{h_m{}^{+}Crul\nabla^2 grad\left(h_m{}^{+}\right)-Curl\nabla^2 grad\left(h_m{}^{-}\right)\right\}\left(f(h,l)\right)\right] \quad (29)$$

With the following substitution the non-dimensional form

$$\Theta=\frac{x}{R};\ \bar{Z}=\frac{z}{L};\bar{h}=\frac{h}{c};\ \bar{p}=\frac{p}{P_s};\ H^{-}{}_m=h^{-}{}_m;\ \bar{l}=\frac{l}{c};\ H_m{}^{+}=\frac{h^{+}{}_m}{PH};\epsilon=\frac{e}{C}$$

$$\frac{\partial 2\bar{p}}{\partial \Theta 2}+\frac{1}{2\mu_0}\left\{\frac{\partial \bar{p}}{\partial \Theta}+\frac{\partial \bar{p}}{\partial \bar{z}}\right\}=$$
$$\left\{\left(X_{m_{00}}\nabla div\bar{H}_m{}^{+}-X_{m_{01}}\nabla div\bar{H}_m{}^{+}\right)\left(f\left(\bar{h},\bar{l}\right)\right)+\left(X_{m_{00}}\nabla div.H_m{}^{-}-X_{m_{01}}\nabla divH_m{}^{-}\right)\left(f\left(\bar{h},\bar{l}\right)\right)\right\}+$$
$$\left[\frac{1}{2}\left\{H_m{}^{+}Crul\nabla^2 grad\left(H_m{}^{+}\right)-\ Curl\nabla^2 grad\left(H_m{}^{-}\right)\right\}\left(f\left(\bar{h},\bar{l}\right)\right)\right] \quad (30)$$

In a layee on off at on Somerfield solution or bearing number a positive pressure are generated in a buflic convergent (∏<<φ<<2∏) and divergent (0<<φ<<∏) film.

Bearing Characteristics

Load part I essential for the Bearing on seven and thirteen axial groove journal bearing. To integrate the film pressure acting on journal bearing surface. It has two computic segments of Fe ions into a dipole moment at the layer of electrical double layer Ferro fluid.

$$W_{rFe_{(PH^{+})}{}^{-}\rightarrow Fe}=\frac{1}{2}\int_{p=h_{m_{(PH)}}{}^{+}}^{p=h_{m_{(PH)}}{}^{-}}\int_0^{2\Pi}\bar{p}cos\Theta\, d\Theta d\bar{z} \quad (31)$$

$$\overline{W}_{rFe_{(PH^{-})}{}^{-}\rightarrow Fe}=\frac{1}{2}\gamma\int_{p1=h_{m_{(PH)}}{}^{+}}^{p11=h_{m_{(PH)}}{}^{-}}\int_0^{2\Pi}\bar{p}cos\Theta 1\, d\Theta 1 d\bar{z} \quad (32)$$

$$W_{rFe}=\ W_{rFe_{(PH^{+})}{}^{-}\rightarrow Fe}{}^{2})^{1/2}+\overline{W}_{rFe_{(PH^{-})}{}^{-}\rightarrow Fe}{}^{2})^{1/2} \quad (33)$$

Similarly in dipole pole in at φ direction off it's resultant.

$$\overline{W}_{\varphi_{Fe_{(PH^+)}}{}^{+}\rightarrow Fe} = -\ \frac{1}{2}\int_{p=h_{m_{(PH)}}^{+}}^{p=h_{m_{(PH)}}^{-}}\int_{0}^{2\Pi}\bar{p}sin\Theta\ d\Theta d\bar{z} \tag{34}$$

$$W_{rFe_{(PH+)}\rightarrow Fe} = -\gamma\ \frac{1}{2}\int_{p1=h_{m_{(PH)}}^{+}}^{p11=h_{m_{(PH)}}^{-}}\int_{0}^{2\Pi}\bar{p}sin\Theta 1\ d\Theta 1 d\bar{z} \tag{35}$$

$$W_{\varphi Fe}=(\overline{W}_{\varphi_{Fe_{(PH^+)}}{}^{+}\rightarrow Fe}{}^{2} + W_{\varphi Fe_{(PH+)}}{}^{-}\rightarrow Fe}{}^{2})^{1/2} \tag{36}$$

Load carrying capacity it's two resultant W_{rFe}, $W_{\varphi Fe}$.

The flow at on a flotic into Land and Groove region with Varitic high polarized Di –pole moment in the stage Fe II to Fe III to be stabilized crystalline atom. The pressure on at a realistic at on leakage can be obtained by integrating the axial velocity component w [Equation (26-27)] accesses bearing end section. The dimensional side leakage is calculated

$$\bar{Q}_1 = \int_0^{h^-m}\int_0^{2\Pi} \frac{1}{2\mu_0}\left|\left\{\left(\frac{\partial p}{\partial x}\right) - \mu_0 X^-{}_m h^-{}_m grad(h_m\ )\right\}X\left\{y(y-h) + 2l^2\left\{1-[1/cosh\left(\frac{h}{2l}\right)\left(cosh\left(\frac{2y-h}{2l}\right)\right)]\right]\right\}\right] R d\Theta dy \tag{37}$$

$$\bar{Q}_2 = \int_0^{h'm}\int_0^{2\Pi} \frac{1}{2\mu_0}\left|\left\{\left(\frac{\partial p}{\partial x}\right) - \mu_0 X^-{}_m h^+{}_m grad(h_m{}^-)\right\}X\left\{y(y-h) + 2l^2\left\{1-[1/cosh\left(\frac{h}{2l}\right)\left(cosh\left(\frac{2y-h}{2l}\right)\right)]\right]\right\}\right] R d\Theta dy \tag{38}$$

So, the total volume flow or end leakage flow rate.

$$\bar{Q}_1+\bar{Q}_2=\bar{Q}_{ft} \tag{39}$$

The friction force can be obtained by integrating the shear stress at the journal surface. Although

$$\eta = \eta\ (I) \tag{40}$$

$$I_{00}=\left(\frac{\partial V_x}{\partial y}\right)^2+\left(\frac{\partial V_z}{\partial y}\right)^2 \tag{41}$$

Though side leakage occurrence being at with +ve poles with a micro-polar molecular $V_x \rightarrow 0$

. It's being posse with higher order $\varphi_{v_{oo}}$, $V_x=V_{z_0}(x,z)+\epsilon V_{Z_{01}}(x,z)$

The ϵ being $\varphi_{00}/\varphi_{0n}$ of positive pressure.

$$I=I_{00}+\epsilon I_{01} \tag{42}$$

$$I=\left(\frac{\partial V_{x0}}{\partial y}\right)\rightarrow 0+\left(\frac{\partial V_{z0}}{\partial x}\right)\epsilon^2\{\left(\frac{\partial V x0}{\partial y}\right)X\frac{\partial V_{x_1}}{\partial y}+\left\{\frac{\partial V_{z_0}}{\partial y}\ \frac{\partial V_{z_{01}}}{\partial y}\right\} \tag{43}$$

After second order of function potential are particle not to be posse. It being zero buflic potential at on 4.2 mom less. It's being posse

$$\eta_1 = 2\epsilon^2\{\left(\frac{\partial V_{x0}}{\partial y}\right) X \frac{\partial V_{x_1}}{\partial y} + \left\{\frac{\partial V_{z_0}}{\partial y} \; \frac{\partial V_{z_{01}}}{\partial y}\right\}\} \tag{44}$$

Though

$$V_{x_0} = \left\{\frac{wR}{h}\right\} y \tag{44i}$$

$$I_1 = 2\{\left(\frac{wR}{h}\right)\left(\frac{\partial V x_1}{\partial y}\right)\}$$

$$\eta_0 = 2\epsilon \, I \, ({h^+}_m - {h_m}^-) \tag{45}$$

$$\tau = \mu_0 \left[\frac{\partial u}{\partial y}\right](y=h) - \eta_0 \left[\frac{\partial 3u}{\partial y}\right](y=h) \tag{46}$$

$$= \int_{h^-m}^{h^+m}\int_0^{2\Pi}\left\{\left(\frac{wR}{u}\right) - \frac{1}{2}\left[\frac{\partial p}{\partial x} - \mu_o X_m {h^+}_m \, grad({h^+}_m)\right]\{(2y-h) - 2l\sinh\left(\frac{2y-h}{2l}\right) X \frac{1}{\cosh\left(\frac{h}{2l}\right)}\right\} - \frac{\eta_0}{2\mu_0}\left\{\frac{\partial p}{\partial x} - \mu_0 X_m {h_m}^+ grad({h^+}_m)\right\}\left[\sin\left(\frac{2y-h}{2l}\right)/\cos\left(\frac{h}{2l}\right)\right]$$

$$dzd\Theta * 32 l^2 \text{Sinh}\left(\frac{2y-h}{2l}\right) * \frac{1}{\cos\left(\frac{h}{2l}\right)} \tag{47}$$

Frictional parameter is f(R/C) $= \bar{F}_s/w$ the inertia carry way 0 to 2Π, although the bearing characteristic,such as the load carrying capacity in equation (35), leakage flow rate in (38) and frictional parameter in equation (47) cannot be obtained by direct integration, it can be numerically calculated by either, Gaussian quadrature or Simpson 1/3,3/8 rule.

Energy Equation

In the derivation of generalized modified Reynolds equation for poly (acrylic acid) oligomer stabilized Superparamagnatic Ferro fluid flows, it was assumed that the velocity of lubricant was the average viscosity with pH effect are to be improve and was constant throughout the film. But in actual case the variation of viscosity with temperature should be considered. The work is being done on the fluid because of shearing action of heavy flow in fluid particle precipitated with oligomer crystal in pH value. These cause the temperature rise in the fluid film. The increase in temperature changes the crystal bounding in Superparamagnatic Ferro fluid results the variation of viscosity and creates the increment the film boiling temperature and the boiling film flow rate effect in velocity component and thus heat flow due to conduction should be along two velocity component.

The Nausult equation can be written $Nu = 0.425\left[\frac{{L_c}^3 \rho_v(\rho_l - \rho_v) g(h_{fg} + .4C_{pv}\Delta T)}{(\mu_v K_v \Delta T)}\right]^{0.25}$ (48)

From Navier stroke equation, Z component of velocity component

$$\rho\left(\frac{\partial v_z}{\partial t} + v_x\frac{\partial v_z}{\partial x} + v_y\frac{\partial v_z}{\partial y} + v_z\frac{\partial v_z}{\partial z}\right) = -\frac{\partial p}{\partial x} - \left(\frac{\partial \tau_{xx}}{\partial x} + \frac{\partial \tau_{yx}}{\partial x} + \frac{\partial \tau_{zx}}{\partial x}\right) + \rho g_x \tag{49}$$

$$\frac{\partial 2z}{\partial t2} = \left[(\lambda_0 + \mu_0) + \left(\lambda_1 + (\mu_{1+\mu_2)} \frac{\partial}{\partial t}(\frac{\partial \Delta}{\partial z})\right) + \left(\mu_o + \mu \frac{\partial \nabla 2w}{\partial t}\right) + (\eta_0 * + \eta_1 * \frac{\partial}{\partial t}(\nabla 2 \frac{\partial \nabla}{\partial z} - \nabla 2w) - (\beta_0 + \rho^{\frac{\beta_1}{K_t}\frac{\partial}{\partial x}(\frac{\partial \theta}{\partial z})}\right] \quad . \tag{50}$$

Now at normal temperature with considering time parameter its relevant equation for the Superparamagnatic Ferro fluid equation is as follows

$$\frac{\partial 2\bar{P}}{\partial t2} = \frac{\partial 2\bar{p}}{\partial z2} * \frac{\partial 2z}{\partial t2} = \frac{\partial 2\bar{z}}{\partial t2} * \left(\frac{\partial 2t}{\partial \Delta T_{(p,v)}}\right)$$

$$\frac{\partial 2\bar{p}}{\partial z2} = \frac{\partial 2\bar{z}}{\partial t2} * \left(\frac{\partial 2K}{\partial \Delta T_{(p,v)}}\right)$$

$$\frac{\partial 2k}{\partial \Delta T2} = 0.425 \left[\frac{L_c{}^3 \rho_v(\rho_l - \rho_v) g (h_{fg} + .4 C_{pv} \Delta T)}{(\mu_v K_v \Delta T)}\right]^{0.25}$$

Turbulent flow on film boiling at temperature constraint

$$\Delta T = T^3 [1 + 3 \frac{\Delta \bar{T}}{T}] \tag{51}$$

In the above mentioned, it is incriminated terms in film boiling, the higher order terms are neglected due to continuous precipitation on oligomer crystal in degradation of PH value particle in Superparamagnatic Ferro fluid.

Due to inter integrating approach substitute in equation (50) and I derived the equation

$$\frac{\partial 2\bar{P}}{\partial \theta 2} + \frac{1}{2\mu_0}\left(\frac{\partial \bar{p}}{\partial \theta} + \frac{\partial \bar{p}}{\partial z}\right) + f(\bar{h}, \bar{l}) \frac{\partial 2\Delta \bar{P}}{\partial \theta 2} + \left(\frac{D}{2L}\right)^2 \left(\frac{\partial 2\overline{k_{pH}}}{\partial t2}\right).425 \left\{\frac{L_c{}^3 c \rho_v(\rho_l - \rho_v)}{6\mu T^3(1 + 3\frac{\Delta T}{T})}\right\}^{0.25} (h_{fg}) + f(\bar{h}, \bar{l})$$

$$\frac{\partial 2\Delta p}{\partial \theta 2} + \left(\frac{D}{2L}\right)^2$$

$$= \left\{\left(X_{m_{00}} \nabla div H_m{}^+\right) - X_{m_{01}} \nabla div H_m{}^+\right\}\left(f(\bar{h}, \bar{l})\right)$$

$$\left\{\left(X_{m_{00}} \nabla div H_m{}^-\right) - X_{m_{01}} \nabla div H_m{}^-\right\}\left(f(\bar{h}, \bar{l})\right)$$

$$+\left\{\frac{1}{2}\left\{H^+{}_m crul\left(\nabla^2 grad(H^+{}_m) - H^+{}_m crul(\nabla^2 grad(H^+{}_m))\right)\right\}\right\}] \tag{52}$$

RESULTS & DISCUSSIONS

On the basis of modified Stokes micro continuum theory i.e. Sugato micro continuum theory, the influence of Superparamagnatic Ferro fluid on the hydrodynamic lubrication of finite journal bearing was examined. The modified Reynolds equation is derived using the Stokes constitutive equation to account for the Ferro fluid effects due to the lubrication blended with oligomer crystal. The mesh for the film extent has 90 intervals in the circumferential direction and 15 intervals is across the bearing width. With the zero pressure gradient condition, the film pressure is solved numerically using the conjugate gradient method (CGM) of iteration terms or the method of 1/3 iteration in computation method in C language. Based on the three terms recurrence or iteration which I search direction optimal value of recurrence factor or iterated the terminal optimization of film pressure. In present evaluation in the tolerance of the stop citations is.0005.

According to stokes theory, the new material constant η is responsible for the magnetic property under Super paramagnatic Ferro fluid. The dimension is the pH value in fluid solution of oligomer crystal in non-Newtonian lubricant. With dint of dimensionless parameter l=l/c this magnetic force coefficient characterized the effect of magnetic force on the bearing characteristics of the system. As the value of α approaches zero, the dimensionless Reynolds number reduce to water Ferro fluid lubricant case. When the value of α is large (either K_a is large or small C), the ferromagnetic force effects are expected to the significant. In these present paper I taken as a parameter of pH 2.43~8.84 length to diameter ratio $\lambda \rightarrow 0$ (short bearing approximation).1, 5.1 $\rightarrow \alpha$ (along bearing approximation), eccentricity ratio ϵ=.1~.01 use in jet propeller connected with shaft bearing with normal length 76’’(.484076m) and diameter 5/8” (.00398089m),9/8”(.005661712m)

Load Carrying Capacity

Figure 3 shows the influence of magnetic force coefficient (α) on dimensionless load carrying capacity. Although the magnetic effect with presence of high value pH oligomer stabilized crystal cause f babbling foams sinks age of the active region, the abdicative pressure regenerated with a region around the position angle of wire (ϕ=Π/2) cancel the effect and a large increase of load capacity is achieved. The load capacity is increased h_m magnetic film by 54.32% as ϵ=.1 compared to coupled stress fluid. Figure 4 increasing with magnetic film pressure gradient hm it is gradually increasing.

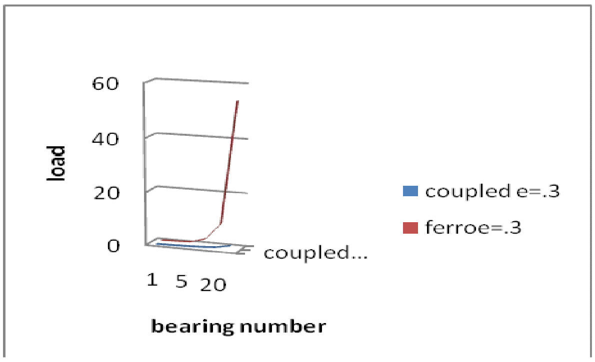

Figure 3: Load Vs Bearing Number, Compression for Coupled and Ferro

Figure 4 shows leakage flow rate $\bar{Q}$ vs. bearing number, magnetic film pressure gradient h_m it is gradually increasing value of different value of ϵ. Although the magnetic effect with pressure of high value pH oligomer stabilized crystal cause babbling foams sink age of the active regime with high pressure of oligomer crystal being brake to rotate to the crystalline foams creates lick age flow rate in cavity zone groove region in the hydrodynamic bearing. The leakage flow rate is increased h_m magnetic film by 44.442 % as ϵ=.1 compared to coupled stress

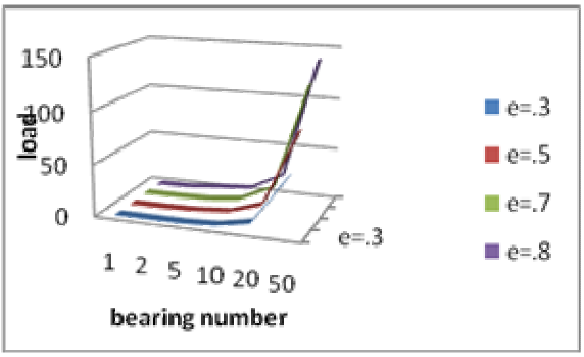

Figure4: Load Vs Bearing Number, Varying e

Figure 5 By increasing ϵ value with magnetic film pressure gradient h_m the leakage flow rate is gradually increasing

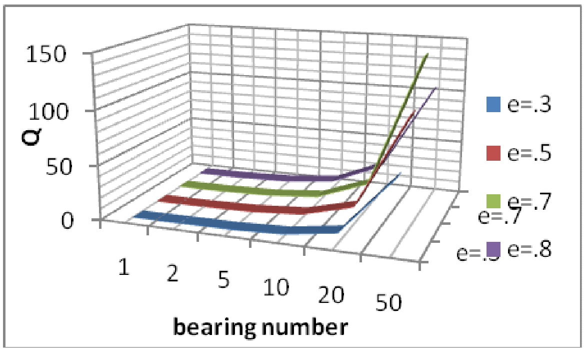

Figure 5: Leakage Flow Rate vs. Bearing Number with Different ϵ

Frictional Parameter

Figure 6 shows frictional parameter f(R/C) as a function of Superparamagnatic oligomer stabilized Ferro fluid with different value of e. Since the magnetic film pressure gradient h_m is increased with increased value of e the frictional parameter is gradually increased.

Pressure Distribution

Figure 7, Figure 8 and Figure 9 shows the effect of magnetic misalignment and Non-Newtonian lubricant on the Non-dimensional center line pressure distribution. It is clearly shows that there is a considerable pressure through the whole section. The increase is due to the oligomer crystal being stabilized of Superparamagnatic Ferro fluid with a negative gradient of the magnetic field ($\frac{\partial h_m}{\partial z}$) which cause negative gradient of magnetic terms ($\alpha . h_m^3 \frac{\partial}{\partial z}\left(h_m\left(\frac{\partial h_m}{\partial z}\right)\right)$ and thus positive magnetic pressure develops a wage action. The effect of the negative magnetic gradient depends mainly on the coefficient (α) in vertical misalignment with three condition n=1, n<1,n>1 not only the cause an increase of the conventional hydrodynamic pressure but also new region of positive pressure are generated.

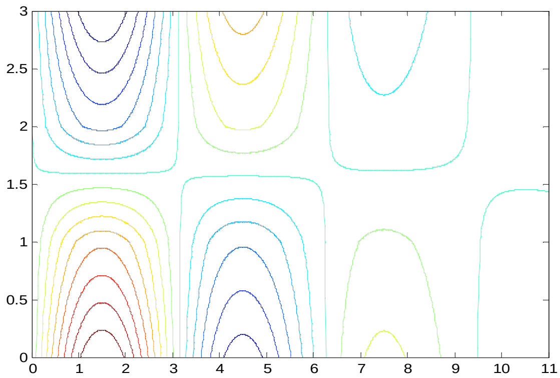

Figure 6: Frictional vs. bearing number with different ϵ

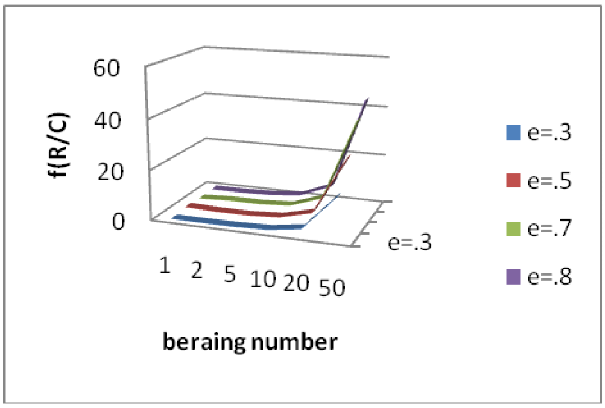

Figure 7: Non –Dimensional Pressure Case n=1 Magnetic Vertical Misaligned β=.75

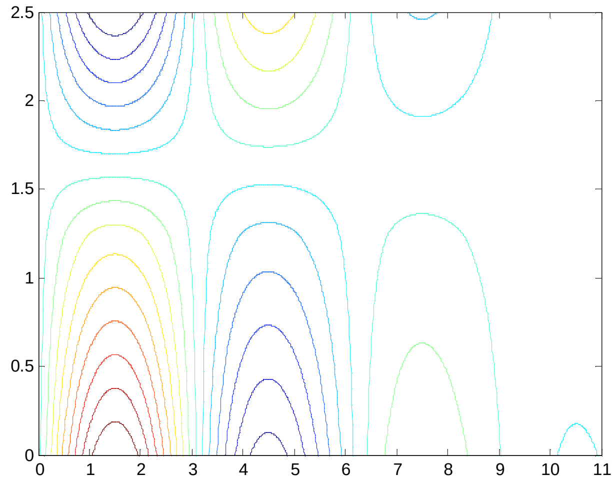

Figure 8: Non –Dimensional Pressure Case n>1 Magnetic Vertical Misaligned β=.75

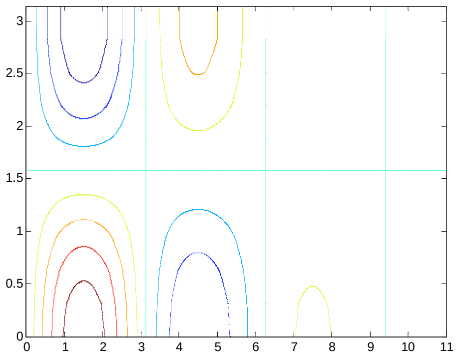

Figure 9: Non Dimensional Pressure Case n>1 Magnetic Vertical Misaligned β=.75

The variation of non dimensional squeeze flow for Ferro fluid concave film pressure $\overline{P}$ with circumferential coordinate for magnetic pressure gradient h_m. It is observed with increment value of h_m film pressure increase.

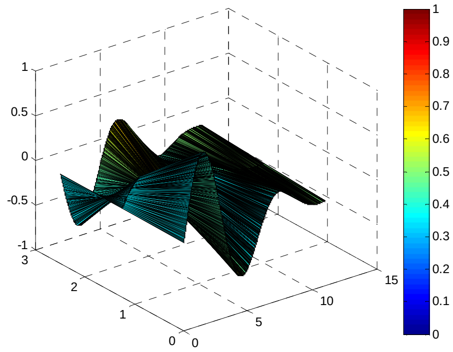

Figure 10: Pressure Distribution Curve is More Sectional area Computed in Poly (Acrylic Acid) Oligomer Stabilized Super Paramagnetic Ferro-Fluid

CONCLUSIONS

On the basic of sugato micro quantum theory this paper predicts the effect of poly (acrylic acid) oligomer stabilized super paramagnetic Ferro-Fluid of its performance rotor motor journal bearing system. The modified Reynolds equation is derived by using the Stokes constitutive predicated for Ferro fluid. Magnetization effect is with its bearing characteristics. As it magnetic film gradient and the value of magnetic film gradient approaching to zero, the bearing characteristics produced a zero suspension of oligomer particle a magnetic dipole in a spin tensor surrounding the Ferro crystal. I determine the Superparamagnatic Ferro fluid with effective magnetic dipole force blinding with stabilized oligomer crystal with minimum 34.35% to 54.44% of its incremental value of load carrying capacity with reduction friction 23% to 88%.

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